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Elliott N Kramsky
Suite 400
5850 Canoga Avenue
Woodland Hills, CA 91367

EXAMINER	
VLAHOS, SOPHIA	
ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/555,716	SPAHLINGER, GUENTER	
	Examiner	Art Unit	
	SOPHIA VLAHOS	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/05/08*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *32-38,41-46 and 53-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *32-38 and 41-46* is/are allowed.

6)☒ Claim(s) *53-56 and 59-61* is/are rejected.

7)☒ Claim(s) *57 and 58* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 December 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings were received on 12/12/08. These drawings are acceptable.

Allowable Subject Matter

2. The indicated allowability of claim 53 is withdrawn in view of the previously discovered reference(s) to Khoury et al. (U.S. 6,121,910), Schweickert et al. (U.S. 6,801,590) and Shaeffer (U.S. 7,248,628). Rejections based on the cited reference(s) follow.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 53-54, 56, 59, 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khoury et al. (U.S. 6,121,910) in view of Schweickert et al. (U.S. 6,801,590) and Shaeffer (U.S.7,248,628).

With respect to claim 53, Khoury et al. disclose: production of a control error signal from the difference between the complex input signal and a feedback signal (Fig. 2, adder 102, which adds a negative feedback signal F (this is a subtraction) from input

signal, column 4, lines 45-49); conversion of the control error signal to a control signal; (Fig. 2, block 104, filters the control error signal and the filtered output signal corresponds to a control signal, since the value of it controls the operation of the rest of the circuit in Fig. 2, column 4, lines 49-53, column 5, lines 32-33); multiplication of the control signal by a complex mixing signal (Fig. 2 see multiplier 206, (complex analog mixer), column 5, lines 30-33) oscillating at the frequency ω_0, (see Fig. 3 shows details of Fig. 2, column 4, lines 11-16, see the mixing signals, column 5, lines 41-47, column 4, lines 53-62, see case where translation to a higher frequency takes place, this corresponds to up-mixing) with at least one of a real part and an imaginary part of a control signal, up-mixed by ω_0, being produced (Fig. 3 shows the separate real and imaginary parts of the control signal B, up-mixed by famix, column 5, to generate C_I and C_Q lines 41-47, column 4, lines 53-62); quantization (Fig. 2 see block 208, a complex quantizer, see column 5, lines 33-36) of at least one of the real part and imaginary part of the control signal, up-mixed by ω_0 (Fig. 2 and column 5, lines 33-36 quantizes both real and imaginary part of the up-converted control signal) in order to produce a pulsed signal (Fig. 2 , output of block 208, the quantizer is I/Q digital output signal which corresponds to the pulsed signal); and with the pulse modulation being carried out at a sampling frequency ω_A which is 2 to 1000 times higher than the mixing frequency ω_0 (column 7, lines 21-24 where the sampling frequency of block 108 of frequency translating $\Sigma\Delta$ modulator 100 shown in Fig. 2 comprises a pulse modulator, is fs=4fmix it is 4 times higher than the mixing frequency output by the local oscillator); production of the feedback signal from the pulsed signal to (Fig. 2, section 109, is the feedback

branch, see column 5, lines 9-26 describe using the pulsed signal to generate the signal F which is subtracted by adder 102 of Fig. 2).

Khoury et al. do not expressly teach: a complex input signal; with the pulse signal which is produced by the at least one pulse modulator being uses for electrostatic oscillation stimulation of a resonator.

In the same field of endeavor, Schweickert et al. disclose: a complex input signal (Fig. 2, complex input signal out of block 40, column 2, lines 47-49, see the complex analog signal).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Khoury et al. based on the teachings of Schweickert, so that the input signal is a complex input signal, the rationale for such a modification depends on the particular application and the type of signals being processed.

In the field of sigma-delta modulator applications, Shaeffer discloses: with the pulse signal which is produced by an at least one pulse modulator being used for electrostatic oscillation stimulation of a resonator (Fig. 2, where blocks 204, 206 comprise a pulse modulator, outputting signal 214, to resonator filter 208, column 2, lines 59-63, column 4, lines 54-56 , Fig. 3 shows an analog input to the pulse modulator and a digital output out of it).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Khoury et al. as modified by Schweickert et al. based on the teachings of Schaeffer so that it is used to combine an analog signal with

a correlating signal to obtain a resulting signal that is subsequently filtered and sampled (Schaeffer, column 1, lines 6-24, column 2, lines 49-58).

With respect to claim 54, the system obtained by modifying Khoury based on the teachings of Schweickert et al further includes: characterized in that the control error signal, the control signal and the feedback signal are each complex signals, which each have a real signal component as well as an imaginary signal component (the system of Khoury was modified to process complex input signals (with real and imaginary components as shown by Schweickert et al), therefore in the modified system shown in Fig. 2 of Khoury is configured to processes complex signals, therefore the control error signal, the control signal and the feedback signal are each complex signals, so that addition, filtering and other operations are consistently performed on the same type of signals (in this case complex signals))

With respect to claim 56, Khoury et al. disclose: characterized in that the real part of the control signal is multiplied by the real part of the complex mixing signal oscillating at the frequency ω_0 (Fig. 3, blocks to the right of block 104 and multiplier 302 used for the I-path, multiplier 306 used for the Q-path, the LO signal (out of block 304) with 0 degree phase shift corresponds to the real part of the complex mixing signal) and a first result signal is thus produced (Fig. 3, C_I is the first result signal), and in that the imaginary part of the control signal is multiplied by the imaginary part of the complex mixing signal oscillating at the frequency ω_0, (Fig. 3, the LO signal (out of block 304) with 90 degree phase shift, corresponds to the imaginary part of the complex signal

oscillating at the frequency ω_0) and a second result signal is thus produced (Fig. 3, C_Q is the second result signal).

With respect to claim 59, Khoury et al. further disclose: characterized in that a noise level is added before the quantization of at least one of the real part and imaginary part of the control signal up-mixed by ω_0 (see column 7, lines 50-51, 59-62, see additive white noise of sigma-delta modulators, block 720 A/D performs signal quantization).

With respect to claim 61, Shaeffer et al. further disclose: characterized in that the mixing frequency ω_0 of the pulse modulator corresponds to one resonant frequency of the resonator (see column 4, lines 60-63, case when the correlating signal has zero frequency).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Khoury et al. as modified by Schweickert et al. based on the teachings of Schaeffer so that it is used to combine analog signals with a correlating signal.

5. Claim 55 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khoury et al. (U.S. 6,121,910) in view of Schweickert et al. (U.S. 6,801,590) and Shaeffer (U.S.7,248,628) as applied to claim 53 and further in view of Roza (U.S. 6,087,968).

With respect to claim 55 all of the limitations of claim 55 are rejected above in claim 53 but neither Khoury et al. nor Schweickert or Shaeffer expressly teach:

characterized in that the control error signal is converted to the control signal by integrating the control error signal (instead Khoury discloses the signal conversion stage comprising a filter 104).

In the same field of endeavor, Roza discloses: the control error signal is converted to the control signal by integrating the control error signal (Fig. 1, block 5 is an integrator (or lowpass filter), and it integrates a difference signal from subtractor 4 (this signal is a control error signal) and supplies the integrated output signal which is a control signal to the next block 6, column 3, lines 49-56).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system of Khoury et al. based on the teachings of Roza so that an integrator is used that averages/smoothes the signal which is input to it (the integrator) so that any variations in the control error signal are smoothed out by the integrator.

6. Claims 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khoury et al. (U.S. 6,121,910) in view of Schweickert et al. (U.S. 6,801,590) and Shaeffer (U.S. 7,248,628) as applied to claim 53, and further in view of Koslov et al (U.S. 6,052.701).

With respect to claim 60, Khoury et al. further disclose: characterized in that the feedback signal is produced by multiplying the pulsed signal by a mixing signal oscillating at the frequency ω_0 (Fig. 2, components inside feedback section 109 include mixer 210 which mixes the pulses signal out of 208 with LOd at fdmix see column 3,

lines 44-51, where the resultant feedback signal has a frequency equal to the input frequency).

Khoury et al. do not expressly teach: a complex-conjugate mixing signal. In the field of complex signal up-conversion-down-conversion, Koslov et al. disclose: a complex-conjugate mixing signal (Fig. 16, see complex-conjugate mixing signal, supplied to down mixer 606, column 11, lines 10-28).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the system of Khoury et al. based on the teachings of Koslov et al. so that down conversion is performed by a simple mathematical operation (complex conjugate, by swapping the real and imaginary components of the complex oscillator output).

Allowable Subject Matter

7. Claims 57-58 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: The prior art of the record fails to teach or suggest alone or in combination: A drive circuit for a micromechanical resonator, which has at least one pulse modulator for conversion of a complex input signal to a pulsed signal, and which has: an adder which adds the fist result signal from the first multiplier and the second result signal from the

second multiplier to form a sum signal in order to determined the real part of the up-mixed control signal, as recited in claim 32 and in combination with other elements of the claim.

Claims 32-38, 41-46 are allowed.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOPHIA VLAHOS whose telephone number is (571)272-5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SOPHIA VLAHOS/
Examiner, Art Unit 2611
2/13/2009

/Mohammad H Ghayour/

Supervisory Patent Examiner, Art Unit 2611